

29823 - Control Engineering

Syllabus Information

Academic year: 2023/24

Subject: 29823 - Control Engineering

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

326 - Escuela Universitaria Politécnica de Teruel

Degree: 440 - Bachelor's Degree in Electronic and Automatic Engineering

444 - Bachelor's Degree in Electronic and Automatic Engineering

ECTS: 6.0

Year: 3

Semester: First semester

Subject type: Compulsory

Module:

1. General information

In this subject the student is expected to know and handle with ease the theoretical contents that support the control of systems using the computer. For this purpose, we start from the model that represents the behavior of the system in the domain of discrete time with one (SISO) or several variables (MIMO). Basic control techniques for sampled systems are learned and the design and implementation of control and estimation algorithms is continued. At the practical level, the student implements on computer the designed controllers/stimulators and experiments with them.

The approach and objectives are aligned with some of the Sustainable Development Goals, SDGs, of the 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>) and certain specific goals. In particular, target 3.6 of goal 3, target 7.3 of goal 7, target 8.2 of goal 8 and target 9.4 of goal 9.

2. Learning results

The student:

- Know how to model continuous systems of one or several variables and knows how to handle their discrete representation.
- Know how to apply the basic programming techniques of programmable logic controllers.
- Know how to apply design techniques to computer control.
- Know how to apply the basic techniques of state-space based design. Continuous and sampled systems.
- Know how to program control and estimation algorithms.
- Know how to design a control architecture and choose the most appropriate technology for each component.

3. Syllabus

- Unit 1: Introduction.
- Unit 2: Signal sampling and reconstruction. Analysis of discrete-time systems.
- Unit 3: Design of digital controllers. Technologies.
- Unit 4: System identification.
- Topic 5: Internal description. Continuous and sampled multivariable systems. Analysis. Controllability and observability.
- Unit 6: Control based on internal description.
- Unit 7: Estimation. Design of control systems with observers.
- Unit 8: Blurred control

4. Academic activities

- Lectures (30 horas).
- Problem solving classes (15 hours).
- Laboratory practices (15 hours).
- Teaching assignments (24 hours).
- Personal study and work (60 hours).
- Assessment tests (6 hours)

At EUPT, the degree is offered in two different modalities: on-site and blended learning. For the presential modality all of the above applies. On the other hand, students who choose the blended mode in the EUPT will have from the beginning of the course the work material (moodle platform) and the bibliographical references that will allow them to follow the subject independently. In the week in which the on-site students carry out a practice of laboratory or tutored work session, the teacher

will make the adaptations in the sessions and will enable the means (tutorials) to address the doubts that may arise to the students of the blended learning modality.

5. Assessment system

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Continuous assessment, which consists of three components:

1. Attendance to all practices with profit.
2. Three tests with theory questions and problems that will preferably consist of quizzes conducted through Moodle and may include multiple choice, matching, numerical calculation and/or open questions. These tests will be conducted solely and exclusively in person. Minimum grade in each test: 4 out of 10.
3. Practical work that can be done in groups, but is defended orally and individually.

To pass the course by continuous assessment it is necessary to fulfill section 1 and obtain an average grade in section 2 greater than or equal to 5.

If the defense of the work is carried out and passed (grade equal to or higher than 5 out of 10 in section 3) there is no saturation in the final grade and the grade obtained in section 2 can be raised up to 3 points. If the defense of the paper is not performed this grade saturates in 7 for the final grade.

Global assessment:

It will consist of a written exam (80% of the grade) that will include all the theoretical/problem/practical contents that have been covered during the term, and an oral/written test (20%).

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The assessment of this subject is global. It will be based on 2 rating items:

- T = Individual written test (80%). Graded between 0 and 10 points (minimum grade): 4.0). Assessment from a theoretical and problem-solving point of view.
- P = Evaluation of practical work (20%). Graded between 0 and 10 points, based on previous studies and reports of the practices developed. If such practices are not carried out, each official exam will include, in addition to the individual written test, individual tests (to be carried out in the laboratory) that allow the evaluation of this item.

The overall grade for the course is therefore calculated as shown below: If $(T \geq 4)$, the rating will be: $N = (0.8 * T + 0.2 * P)$. If $(T < 4)$, the grade will be: $N = \text{minimum}\{4, (0.8 * T + 0.2 * P)\}$. The subject is passed with an overall grade of 5 points out of 10 ($N \geq 5$).